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Paired-associate learning as a function of manifest anxiety, stress, intra-list similarity, and stimulus association value.

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PAIRED-ASSOCIATE LEARNING AS A FUNCTION OF MANIFEST
ANXIETY, STRESS, INTRA-LIST SIMILARITY, AND
STIMULUS ASSOCIATION VALUE

LEVITT - 1956

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ANXIETY, STRESS, INTRA-LIST SIMILARITY, AND
STIMULUS ASSOCIATION VALUE

Herbert Levitt

Thesis submitted in partial fulfillment of the
requirements for the M.S. degree in Psychology

University of Massachusetts

1956

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Current theoretical approaches to the role of motivational processes in verbal learning emphasize the predictive importance of interactions of those classes of factors with associative aspects of the task to-be-learned (5). The particular concern of this study was the possible interactive effects on nonsense syllable paired-associate learning of two presumed motivational variables, manifest anxiety and failure-stress, and two task attributes, intra-list similarity and association values. More explicit development of experimental hypotheses, however, will be deferred until data on the influences of manifest anxiety and stress both alone and combined on various types of learning tasks have been considered.

Effects of Motivational Variables

Manifest anxiety.-- A direct relationship apparently holds between manifest anxiety indices and both rate of acquisition and resistance to extinction of simple conditioned eyelid and PGR responses (2,32,34,39). The most common explanation of these findings is based on the Hullian formula, $R = f(H \times D)$ (12), where R represents a performance measure such as frequency of response, H the associative or habit strengths of stimulus-response relationships, and D the general drive level. The application of this formula to simple conditioning assumes that manifest anxiety, for example, Taylor A-scale scores (35), is a direct index

of one component of \underline{D} and also that \underline{H} 's for competing responses are weak. As a consequence, for a given value of \underline{H} , high anxiety or relatively higher \underline{D} should yield a larger \underline{R} than low anxiety or relatively lower \underline{D} .

For differential conditioning, the formula generates the prediction that increased manifest anxiety should result in greater strengths of responses (strictly, excitatory tendencies) to both positive and negative stimuli and larger differences between strengths of the two responses. While Spence and collaborators (29,30) have reported confirming data, the findings of Hilgard, Jones and Kaplan (11) were negative.

Many verbal and motor learning tasks involve strengthening of several responses, each in competition with one or more other responses. For these, the occurrence of incorrect choices and intrusion errors (7,8,18) suggests that the assumption of negligible \underline{H} 's for competing responses is no longer tenable. Accordingly, Spence and coworkers (6,28) have hypothesized that as number and/or relative strengths of competing responses increase, the direct relationship between manifest anxiety and performance proficiency for non-competitive situations should be reduced and eventually reversed; that is, for tasks involving many and/or relatively strong competing responses, the greater the anxiety, the lower the number of correct responses. Data which are in general accord with this formulation have been obtained

for verbal serial learning (4), a serial maze (6), verbal choices (24), water jar and anagram problems (19), and paired-associate learning (28,36).

Stress.-- Lazarus, Deese, and Osler (15) and later Farber (5) have summarized the methods and findings of investigations of the effects on learning of stressful conditions such as failure in various forms and electric shock. Although most investigators have found that stress impairs learning or performance (e.g., 13,23,25,40), others have obtained improved proficiency (e.g., 1,14). Unfortunately, only a few of these studies provide data of relevance to the interaction of stress and task characteristics, for, if it is assumed that stress also increases general drive level, interaction with number and/or relative strengths of competing responses should occur in the manner predicted for manifest anxiety.

Lucas (18), who employed four levels of stress and three levels of intra-serial duplication, failed to obtain a significant F for the interaction of stress and difficulty. Similarly, inspection of data reported by Lazarus and collaborators (4,16) suggests that this interaction was not significant. In a paired-associate motor task, however, Castaneda and Palermo (3) found a significant triple interaction among stress, initial strength of habit, and relative strength of habits in relearning. Two groups of Ss were given stimulus-response pairs for 25 trials to learn a habit

of weak initial strength, while two strong habit groups received 50 trials. For 50 relearning trials under conditions of stress or nonstress, all groups were presented with two stimulus-response pairs in which the correct responses were the same as in learning, and three pairs in which an incorrect response of learning was made correct. Their results indicate that the strong habit-stress group made fewer errors with unchanged pairs or correct response tendencies than the strong habit-nonstress group. Yet, stress produced more errors with changed pairs or incorrect response tendencies for weak habit groups. Thus, although the hypothesized interaction of stress and task variables was not substantiated in the first two studies, the last is corroborative.

Manifest anxiety and stress.-- Manifest anxiety and stress have been combined in four studies. Spence, Farber, and Taylor (31) reported that shock and threat of shock led to stronger performance in eyelid conditioning only for anxious Ss. The triple interaction of anxiety, failure, and intra-serial duplication of Lucas' (18) study was not significant. Anxiety and failure, however, did interact, with non-anxious Ss improving their performance as number of failures increased, in contrast to decreasing proficiency for anxious Ss. Lazarus, Deese, and Hamilton (16) did not present formal statistical analyses of the interaction of anxiety and stress or of anxiety, stress, and intra-serial duplication. On the basis of examination of means and variances

for their groups, however, it seems doubtful that these variance components were significant. Sarason (27) separated high and low motivating instructions for a nonsense syllable serial learning task from failure or neutral experiences during subsequent learning and combined both with high, medium, and low manifest anxiety. Correct responses of high anxiety Ss were reduced by high motivating instructions which conversely increased correct anticipations of medium and low groups. Although the main effect of failure was to decrease performance, it did increase correct responses of high motivation relative to low motivation Ss.

Experimental Hypotheses

Several variables and/or tasks have been used to increase number and/or relative strengths of competing responses and thus produce more difficult tasks. For serial learning, competing responses have been strengthened by increasing intra-list similarity (duplication) of stimuli alone (18) or in combination with decreasing association values (21). Also, greater difficulty has been equated with use of or selected choice points of a 10-unit finger maze (6,37), relatively stronger incorrect verbal choices (24) or paired-associate motor responses (3), set for indirect solution of water-jar problems (19), and synonymity of stimulus members of paired-associates (28). Taylor and Chapman (36) used lists of low similarity but did not indicate whether of stimulus and/or response members.

Despite the considerable range of variables and tasks employed in these studies, several aspects of the main and interactive effects of task characteristics, manifest anxiety, and stress require further investigation. One of these was the role of manifest anxiety and stress in verbal paired-associate learning; for, although this learning procedure has been used extensively in other contexts (38), it had apparently been employed in only two manifest anxiety studies (28,36). Lack of information on how manifest anxiety and stress combine was a second problem in that the four studies (16,18,27,31) which have been reported had not yielded well defined results either with respect to each other or theoretical expectations. Moreover, the confounding of similarity and association values of the stimuli of Montague's (21) lists precluded estimates of independent effects of those variables. Each of these aspects was a concern of the present study. The task was learning a paired-associate list. Both manifest anxiety and stress were varied, and an attempt was made to manipulate intra-list similarity of stimulus members of paired-associates and their association values independently. Thus, paired-associate learning were investigated as a function of manifest anxiety, stress, intra-list similarity of stimulus members, and their association values.

Unless relationships of several variables to each other and to response measures are stated in terms of equations or

formulas, derivation of higher-order interactions is both extremely difficult and likely to be unduly speculative. In the case of the four variables of this study there were empirical as well as theoretical grounds for treating both manifest anxiety and stress as conditions which contributed to general drive level (5,15). Intra-list similarity and association values of stimuli can be treated as habit factors (5). Therefore, as the first step in the derivation of experimental hypotheses two simplifying assumptions were introduced.

The first was that the contributions of manifest anxiety and stress to general drive level combine in some additive or multiplicative fashion. Specifically, if low and high manifest anxiety levels are combined with nonstress and stress conditions, it was assumed that relative strengths of general drive from low to high would be as follows: low anxiety-nonstress, low anxiety-stress and high anxiety-nonstress or the converse, and high anxiety-stress. Relative strengths of the two combinations presumed to yield intermediate levels of drive could not be determined, so, as an approximation, they were considered of equal strength.

The second assumption was that intra-list similarity and association values of stimuli were directly and inversely related to number and/or relative strengths of competing responses, respectively. Both theory and experimental findings (5) are consistent with these assumed relationships.

The role of association value with respect to competing responses, however, may hold only when the stimuli involve dissimilar associates or cue-producing responses (10). If lists combining low and high similarity and high and low association values are constructed, inter-response competition was assumed to be least for the low similarity-high association value lists. The largest number and/or greatest strengths of competing responses were expected to occur in the high similarity-low association value list. Since relative strengths of the two intermediate combinations could not be determined, equality was assumed.

In effect, these assumptions reduced the four experimental variables to two dimensions of variation, drive or D and extent of response competition. Spence and associates (28,37) have hypothesized that under these conditions increased drive will bring about higher performance levels where response interference is negligible and lower performance levels when competing responses are strong. These relationships were stated as three hypotheses, two of which concern the effects of drive and competing responses while the third specifies the interaction of the two variables.

(1) Drive: Because of the postulated reversal in relative proficiency of performance as strength of drive increases, the curves for correct response as a function of increasing combined anxiety-stress drive should diverge in both downward and upward directions

for the least and most difficult tasks. As a consequence, the overall or main effect of drive would probably not be significant.

(2) Response competition: On the basis of a direct relationship between correct responses and degree of response competition, all points of the curve for weak interfering responses would presumably lie above the curves for competing responses of medium strength, which in turn would be above the high strength curve; that is, a significant overall or main effect of competing responses was anticipated.

(3) Drive and response competition: A significant interaction of drive and response competition was predicted with an upward trend as a function of drive for weak competition, relatively flat trends for intermediate degrees of competition, and a curve with negative slope for strong interference. Although formal derivation was eschewed, it was suggested that the negative slope of the latter curve might be somewhat steeper than the positive slope of the first trend.

Three further comments seem appropriate. First, it was considered entirely possible that either or both the arbitrarily assumed equal values for the two intermediate drive and the two intermediate competition combinations would lead to different means of correct responses. Such results would not be inconsistent with the experimental hypotheses and

might provide valuable information about the manner in which these conditions combine. Also, while manifest anxiety and stress have been interpreted as contributing to drive, an assumption that either or both also increase the number of interfering responses could not be rejected. However, if the effects of increased similarity and decreased association value are increased response competition no change in the hypotheses in their present general form would be required. Nor would any changes be required if the effects of these variables were conceived entirely in terms of increased extra-list response competition. That these possibilities could also be entertained is, of course, a serious limitation of present theory. Finally, no precise prediction was made of the absolute amounts or size of the slope constants for any curves for drive-correct response relationships with response competition as the parameter. Should the slope constants of the trends for the least and most difficult intra-list similarity-association value combinations differ markedly in size, a significant main effect of strength of drive would be expected. Also, should the curves for intermediate response competition have slopes significantly greater or less than zero, a similar outcome would be obtained.

Method

Subjects.-- The Taylor Manifest Anxiety Scale in the guise of a Biographical Inventory was administered to approximately 800 students enrolled in the course in introductory psychology at the University of Massachusetts. Eighty high anxiety and 80 low anxiety ss were selected from among those whose manifest anxiety scores were in the upper and lower fifths of the distribution of all scores, respectively. The 80 ss in each of these groups were randomly assigned to the eight combinations of stress-nonstress, high and low similarity, and high and low association value. There were 10 ss in each of the 16 cells thus formed.

Paired-associate lists.-- The four paired-associate lists each consisted of eight three-letter nonsense syllables from Glaze's (9) lists. Stimulus syllables of paired associates differed with respect to similarity and association values. The 93% and 100% syllables were used for the two high association value lists while those of the two low association value lists had values of 0% and 7%.

Stimulus members of high similarity lists consisted of the smallest number of different letters which, at the same time, maximized the number of common letters in high and low association value syllables. Three different consonants were required for first letters of the syllables, three different vowels for second letters, and three additional different consonants for third letters. The low similarity

syllables of both high and low association value consisted of up to 21 different letters. Of these, eight different consonants were used as first letters, five vowels as second letters, and eight additional consonants as third letters.

The same nonsense syllables served as response members for all four lists. These syllables of 47% to 53% association value were formed from about 15 different letters. Thus, they were of intermediate association value and similarity. Table 1 gives the four lists.

These lists were presented by a modification of the group method developed by Saltz and Myers (26). This method involved far less time for collection of data and has given results for variations in association value, intra-list competition, and intelligence which parallel those obtained when Ss are run individually.

Four learning booklets were prepared. Each booklet consisted of eight $4\frac{1}{4} \times 2\frac{3}{4}$ in. pages on each of which one of the paired-associates appeared. There were different randomly determined orders of pairs within each booklet. The booklets were stapled to four different places from top to bottom of a 7×11 in. sheet of heavy posterboard.

A test booklet was stapled to the other side of the posterboard. Each $4 \times 5\frac{1}{2}$ in. page of the test booklet consisted of a list of only stimulus members of paired-associates. The order of stimulus members alone on each page corresponded to their orders in the four learning book-

Table 1

Paired-associate Nonsense Syllables used in Combination with Stress and Anxiety

Easy (I)	Intermediate		Hard (IV)
	(II) Low Similarity- High Association Value	(III) Low Similarity- Low Association Value	
GOB KUM	VAR KUM	CIJ KUM	QIH KUM
JIN GOW	BIL GOW	FEH GOW	XUM GOW
VIC HEB	VIC HEB	WOG HEB	XUC HEB
YUT LOZ	BEC LOZ	VUK LOZ	XIH LOZ
WAK JEP	DAR JEP	ZOT JEP	QIM JEP
FEL ZUG	VIL ZUG	XAD ZUG	VEH ZUG
MEX BAJ	DEC BAJ	YIL BAJ	QEM BAJ
DOZ GIJ	PER GIJ	MEB GIJ	VEC GIJ

lets.

Learning of paired-associates.-- Twenty trials were administered to Ss in all 16 conditions. This number was determined by means of a preliminary experiment with Ss from the whole range of anxiety levels without stress. The number selected approximated trials required for Ss in high similarity-high association value and/or low similarity-high association value conditions to reach group means of 7 of 8 correct responses.

The Ss of the main experiment were run during the last two weeks of classes of the first semester and during the third week of the second. Because of scheduling difficulties and/or Ss' absenteeism, group sizes varied from 15 to 30. Each of these groups consisted of approximately equal numbers of Ss in each of the eight combinations of levels of anxiety, similarity and association value. Table 2 shows the pre-arranged seating plan for up to 40 Ss. The placement sequence was from row 1, seat 1 to row 5, seat 8. No S had the same paired-associate list as Ss in front of him and to his right and left. Also, high anxiety Ss were evenly distributed among low anxiety Ss.

After being seated Ss in the stress condition were told that the task they were about to learn was highly correlated with academic success. The nonstress Ss received a standard introduction minimizing the importance of their individual rezctions. Subsequent instruction for paired-associate

Table 2

Prearranged Seating Plan for High (H) and Low (L) Anxiety Ss
Learning Lists I, II, III, and IV

Row	Seat							
	1	2	3	4	5	6	7	8
1	I L	II H	III L	IV H	I H	II L	III H	IV L
2	IV H	III L	II H	I L	IV L	III H	II L	I H
3	I L	II H	III L	IV H	I H	II L	III H	IV L
4	IV H	III L	II H	I L	IV L	III H	II L	I H
5	I L	II H	III L	IV H	I H	II L	III H	IV L

learning was the same for both conditions. (See appendix for specific instructions for stress and nonstress conditions, and for the learning of the paired-associate task.)

The four different learning booklets were numbered from one to four and used in random order. On the first trial Ss were told to use booklet "3." When E told them to start they looked at the first pair. Four sec. later they were given a signal to turn the page to the second pair, which was seen for four sec. when the signal to turn again occurred. Each remaining pair was also seen for four sec. After the eighth pair had been seen for four sec. Ss were told to turn the cardboard over and were given 32 sec. to write the correct response syllable after each of the eight stimulus syllables. During an inter-trial interval of about 30 sec. this page was torn off and passed to a second E, who pretended to score the booklets during the next trial.

The procedure of subsequent trials was the same. After being told the number of the booklet they were to use, Ss were paced through the eight pairs so that each pair was seen for four sec. A test trial of 32 sec. followed with the order of stimulus syllables on each page of the test booklet corresponding to syllable order in the learning booklet used for that trial.

Stress procedure.-- During both first and second semester series nonstress groups were completed before Ss were run under the stress condition. Upon completion of both

series, stress Ss were informed, either by telling them or by letter, that the failure had been E-induced rather than "real."

Stress or more precisely failure-stress was induced by the false norm method. After the sixth and tenth trials Ss were informed that they were not coming up to expectations. (See appendix for stress statements.) The nonstress Ss were also interrupted after the same trials, but with innocuous remarks of similar length to control for any distractive affects of simply verbalizing failure-stress cues. (See appendix.)

Questionnaire.-- After finishing the learning task Ss were administered a brief questionnaire designed to obtain self-ratings of their reactions which might permit assessment of the degree of stress which they experienced. (See appendix for reproduction of the questionnaire.) At no time were Ss informed of the connection between the experiment and the Taylor A-scale.

Results

Learning paired-associates.--- Means and standard deviations of correct responses for successive five-trial blocks and for all 20 trials for each of the 16 treatment combinations are summarized in Table 3. Differences among these means were assessed by a "mixed type" analysis of variance design (Table 4) (17). The four experimental variables contributed to "between Ss" effects, and blocks of trials to the "within Ss" effect. Although main effects of intra-list similarity and association value were highly significant (p 's $< .01$), neither the anxiety nor stress main effects were significant. Low similarity and high association value resulted in more correct responses over all combinations of anxiety, stress, and block variables than high similarity and low association value. Since the first-order interaction of these variables was not significant they apparently combine in an additive fashion. (See Fig. 1.)

Stress and anxiety were expected to contribute to interaction more than to main effects. Stress, similarity, and blocks seemed to enter into a cluster of near-significant or significant interactions involving various combinations of these variables. Fig. 2 suggests that stress may have slowed down the acquisition of correct responses. Although the F for the stress x similarity interaction of Fig. 3 was not significant, the trends suggest that stress may have facilitated performance on the low-similarity lists and interfered

Table 3

Means and Standard Deviations of Correct Responses for each Treatment Combination for Successive Five-Trial Blocks and for all 20 Trials

List	Treatment Combination				Trials															
	Intra- list Simi- larity	Associ- ation Value	Stress	Anxiety	1-5				6-10				11-15				16-20			
					Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
II	High	High	Yes	High	12.9	8.7	22.7	11.7	27.0	12.7	30.2	11.5	92.8	42.48						
II	High	High	Yes	Low	10.5	5.6	22.3	12.7	27.6	11.6	31.1	10.5	91.5	39.15						
II	High	High	No	High	11.6	5.6	23.7	9.1	31.8	7.0	34.8	7.7	101.9	26.04						
II	High	High	No	Low	9.2	5.1	18.7	8.9	27.3	8.8	30.9	7.8	86.1	26.75						
IV	High	Low	Yes	High	6.4	3.7	14.1	10.3	20.7	11.7	24.8	12.0	66.0	36.46						
IV	High	Low	Yes	Low	7.1	4.1	15.2	8.0	17.5	6.8	22.1	8.3	61.9	24.66						
IV	High	Low	No	High	9.2	4.5	19.1	8.5	29.1	8.2	31.6	8.0	89.0	25.57						
IV	High	Low	No	Low	7.5	3.0	15.3	7.0	23.3	8.9	27.7	8.9	73.8	25.56						
I	Low	High	Yes	High	14.8	5.4	30.7	5.7	36.0	2.5	39.1	1.1	120.6	13.08						
I	Low	High	Yes	Low	14.3	6.1	29.1	6.9	35.0	5.7	37.3	3.9	115.7	19.99						
I	Low	High	No	High	10.1	6.4	23.7	7.9	32.7	5.0	36.5	2.9	103.0	19.97						
I	Low	High	No	Low	17.8	7.8	32.2	7.9	36.3	6.9	37.9	4.4	124.2	24.97						
III	Low	Low	Yes	High	11.7	4.2	28.8	10.0	33.9	8.2	35.9	5.9	110.3	27.74						
III	Low	Low	Yes	Low	6.7	5.4	17.7	8.8	28.3	10.4	33.4	7.8	86.1	29.42						
III	Low	Low	No	High	8.4	3.9	21.6	6.7	28.6	8.8	32.5	7.9	91.1	25.56						
III	Low	Low	No	Low	9.6	4.0	24.9	7.7	30.9	6.9	34.2	6.2	99.6	21.88						

Table 4

Analysis of Variance of Means for each Treatment
Combination for Successive Five-Trial Blocks

Source	df	SS	MS	F
Between-Subjects				
(A) Anxiety	1	200.26	200.26	
(S) Stress	1	88.51	88.51	
(I) Similarity	1	5,499.02	5,499.02	25.67**
(V) Association Value	1	3,900.62	3,900.62	18.21**
AS	1	172.22	172.22	
AI	1	213.91	213.91	1.00
AV	1	182.76	182.76	
SI	1	445.56	445.56	2.08
SV	1	187.06	187.06	
IV	1	4.23	4.23	
ASI	1	1,113.02	1,113.02	5.20*
ASV	1	15.62	15.62	
AIV	1	138.75	138.75	
SIV	1	120.75	120.75	
ASIV	1	1.57	1.57	
error (b)	144	30,848.74	214.23	
Within-Subjects				
(B) Blocks	3	45,264.15	15,088.05	858.25**
AB	3	42.46	14.15	
SB	3	128.86	42.95	2.44
IB	3	655.03	218.34	12.42**
VB	3	56.53	18.84	1.07
ASB	3	74.04	24.68	1.40
AIB	3	8.52	2.84	
AVB	3	25.27	8.42	
SIB	3	211.52	70.51	4.01**
SVB	3	9.12	3.04	
IVB	3	60.52	20.17	1.14
ASIB	3	153.12	51.04	2.90*
ASVB	3	40.72	13.57	
AIVB	3	194.17	64.72	3.68*
SIVB	3	17.72	5.91	
ASIVB	3	16.39	5.46	
error (w)	432	7,592.86	17.58	
Total	639	97,689.60		

*Significant at .05 level.

**Significant at .01 level.

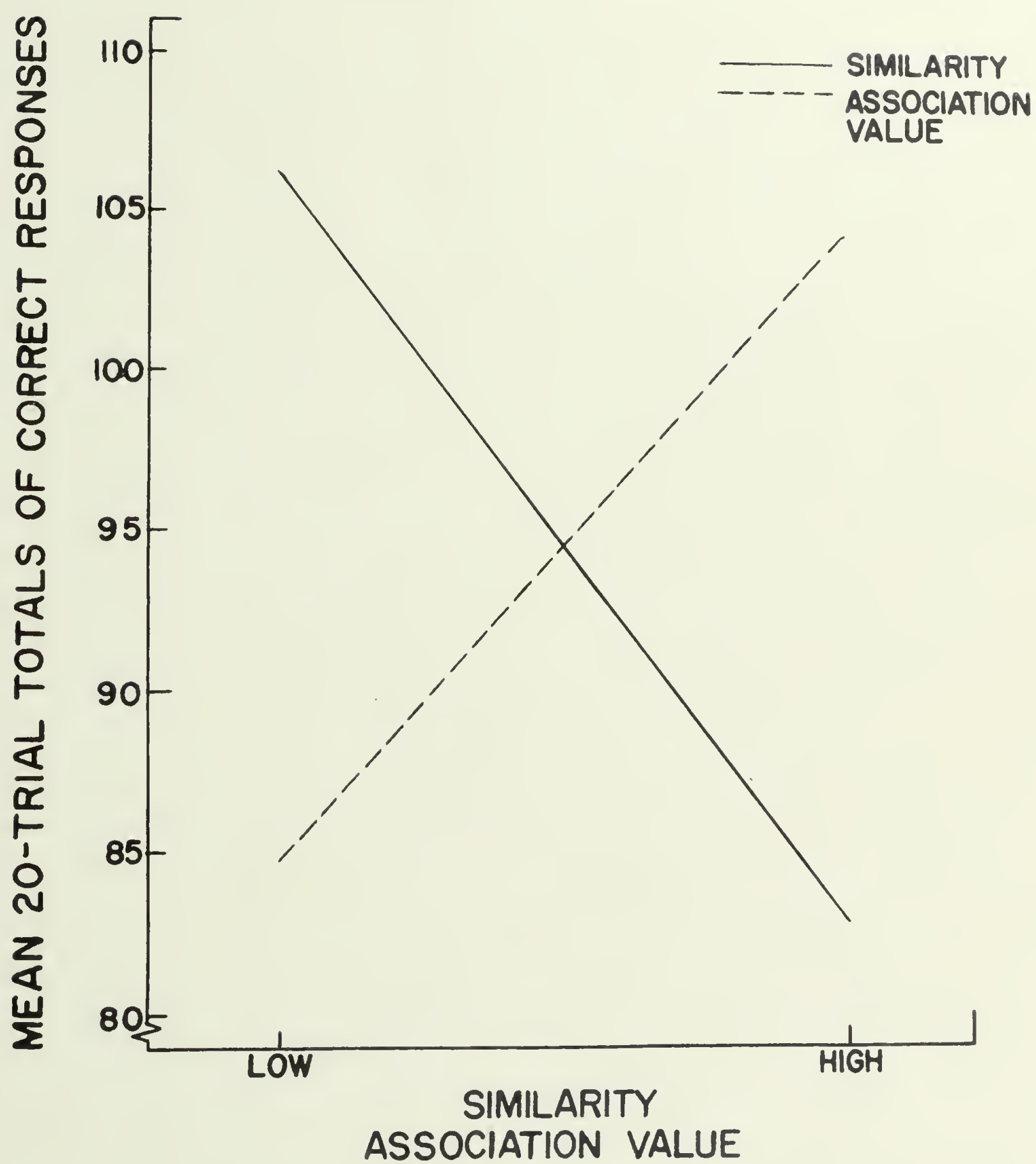


Fig. 1. Mean 20-trial totals of correct responses as a function of intra-list similarity and association value.

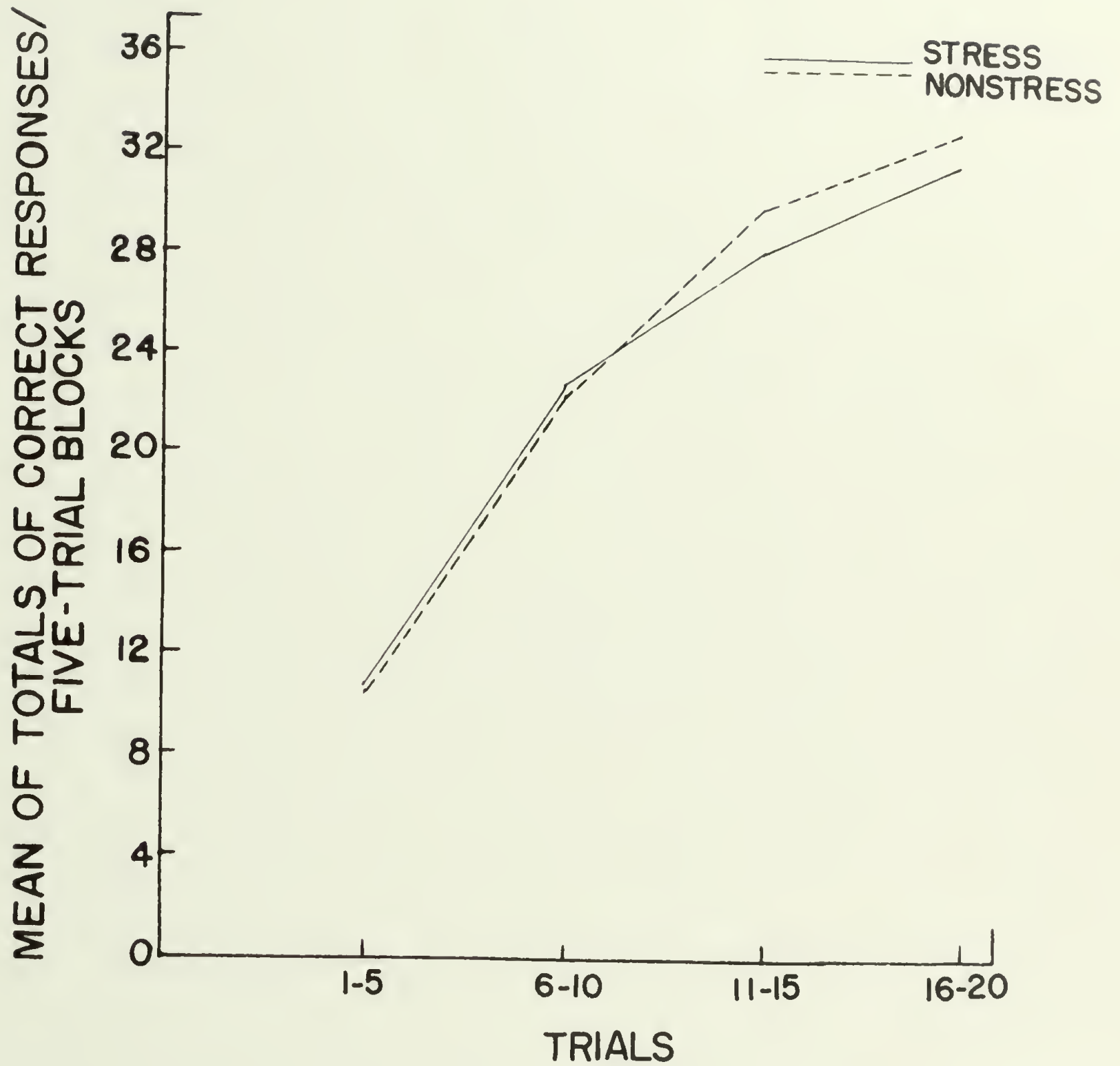


Fig. 2. The influence of stress on mean correct responses per five-trial block. Stress was introduced after the sixth and tenth trials.

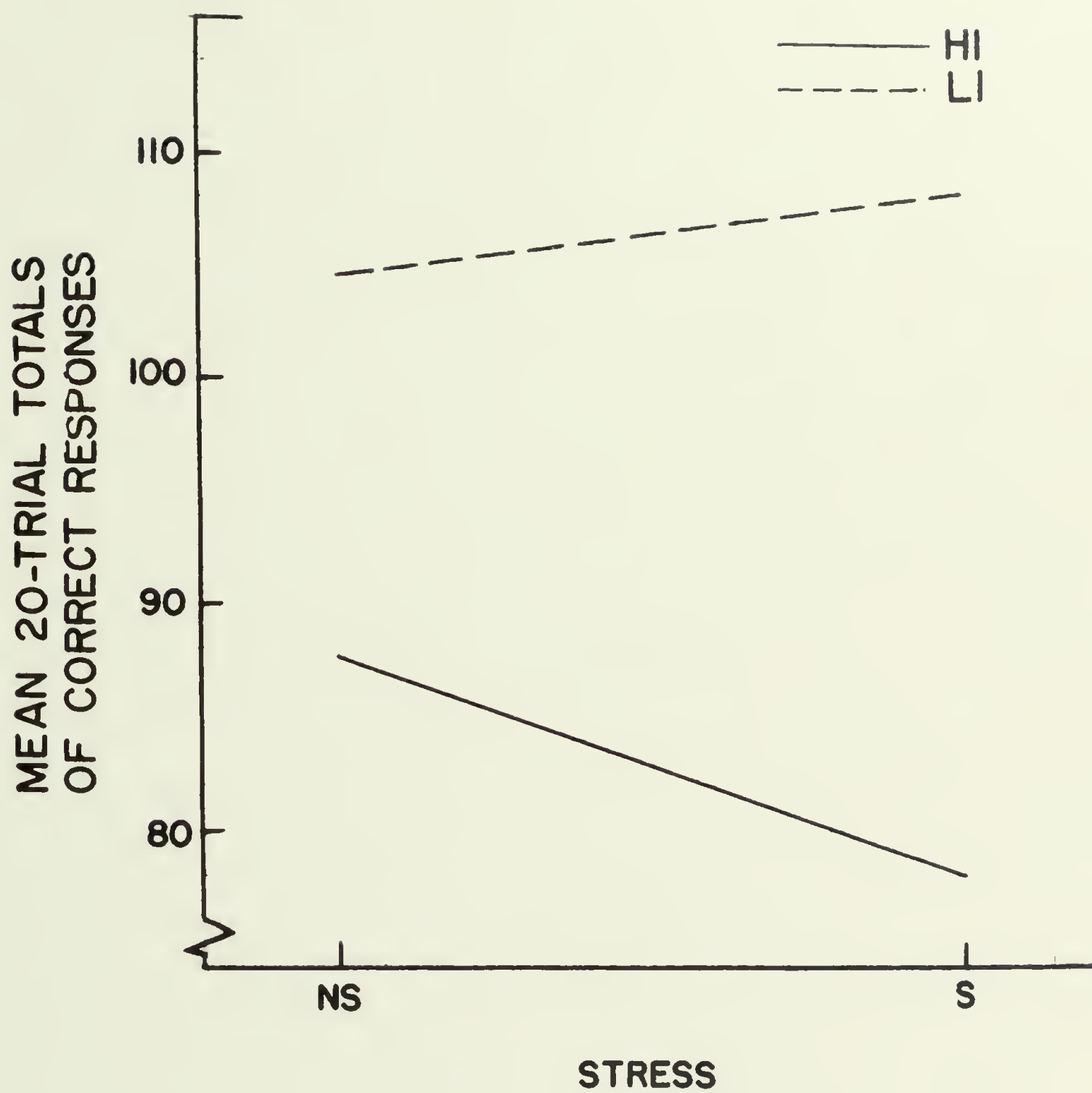


Fig. 3. Mean 20-trial totals of correct responses as a function of stress with similarity as the parameter.

with performance on the high-similarity lists. The interaction of stress x similarity x blocks shown in Fig. 4 is consistent with the first-order interactions of these variables. Low similarity lists under both stress and nonstress were learned more rapidly than high similarity lists. But the facilitative effect of stress for the low similarity lists was reversed with high-similarity lists.

The third-order interaction among these same variables and anxiety (anxiety x stress x similarity x blocks) is shown in Fig. 5. Only the reversal of positions of nonstress-high anxiety and stress-anxiety curves for low similarity lists fails to bear out the apparent facilitative effect of stress on low similarity lists. The nonstress-high anxiety curve over all four blocks and the nonstress-low anxiety curve for the last two blocks are above those of the curves for the two nonstress-anxiety combinations. Thus, the general pattern of the interactions shown in Figs. 2, 3, 4, and 5 suggests that for low similarity lists stress facilitated performance while lowering it for high similarity lists.

Although interactions of anxiety x stress x similarity and anxiety x similarity x association value x blocks were significant, neither could be meaningfully interpreted in terms of facilitative or inhibitory effects of stress and/or anxiety. Stress entered into no significant interactions with association value. Nor did anxiety contribute to any

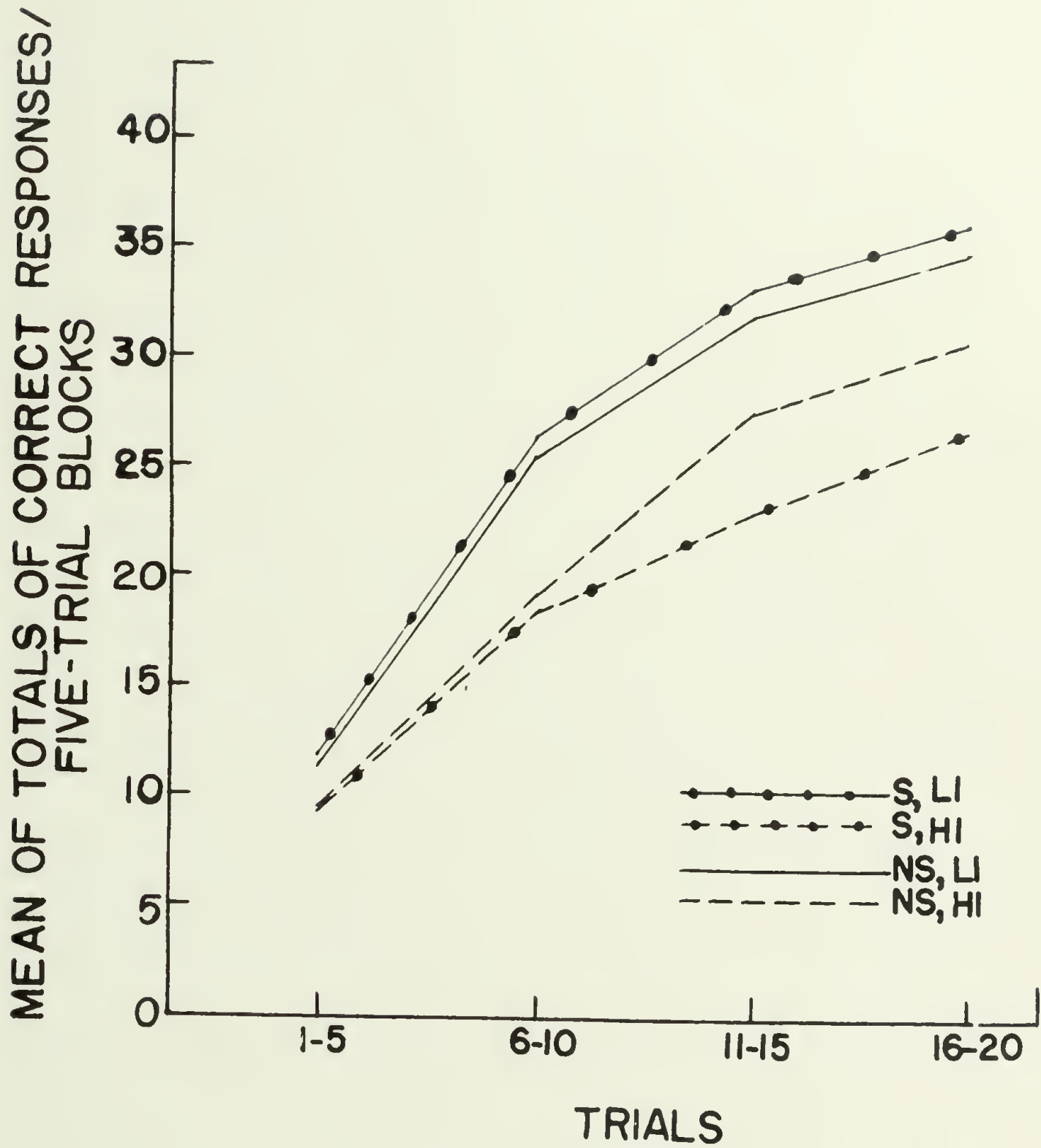


Fig. 4. Mean correct responses per five-trial block with stress and intra-list similarity as parameters.

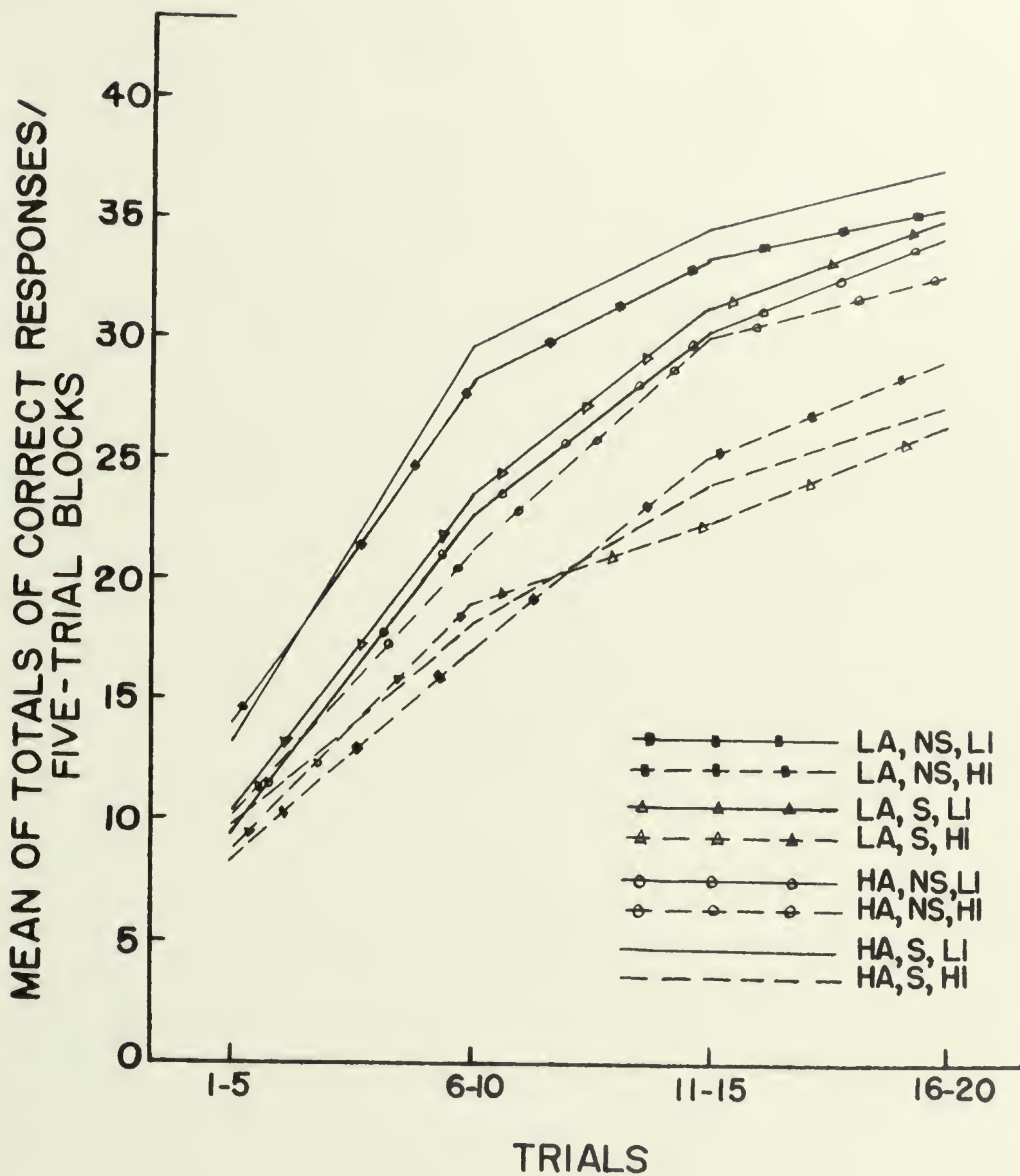


Fig. 5. Mean correct responses per five-trial block with stress, anxiety, and intra-list similarity as parameters.

additional interactions.

Questionnaire responses.-- The five post-learning questionnaire items were designed to ascertain Ss reactions to the test, the experimental conditions, the examiners, the test's predictive value, and their success on the test. Scores of from 0 to four were assigned to the five points from extreme positive to extreme negative reactions. Means and standard deviations for high and low anxiety Ss under stress and nonstress conditions are summarized in Table 5. The analysis of variance for these items (Table 6) resulted in only a significant main effect of stress for the test's predictive value. Because one out of five significant main effects of stress might have occurred with a probability greater than that for a single F , it seems doubtful that stress, anxiety, or their interaction influenced reactions to questionnaire items.

Table 5

Means and Standard Deviations of Self-Ratings of Reactions in and to the Experiment by
High or Low Anxiety Ss under Stress or Non-Stress Conditions

Treatment Combination		Question											
		6				7				8			
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Yes	High	1.65	1.18	1.70	.57	1.22	.70	2.22	.97	1.90	1.04		
Yes	Low	1.87	1.06	1.78	.87	.94	.57	2.13	.92	1.85	1.11		
No	High	1.80	.71	1.98	.84	.98	.69	1.40	1.00	1.94	1.00		
No	Low	1.85	.70	1.80	.90	1.07	.67	1.85	.97	1.85	.91		

Table 6
Analyses of Variance of Means of Self-Ratings of Reactions

Source	df	6			7			8			9			10		
		SS	MS	F	SS	MS	F	SS	MS	F	SS	MS	F	SS	MS	F
(A) Anxiety	1	.75	.75	.84	.10	.10		.30	.30	.75	1.22	1.22	1.28	.23	.23	.22
(S) Stress	1	.15	.15	.17	.90	.90	1.12	.15	.15	.38	12.10	12.10	12.74*	.03	.03	.03
AS	1	.31	.31	.35	.63	.63	.79	1.42	1.42	3.55	3.03	3.03	3.19	.02	.02	.02
Within Ss	156	138.98	.89		124.75	.80		62.62	.40		148.05	.95		163.70	1.05	
Total	159	140.19			126.38			64.49			164.40			163.98		

*Significant at <.01 level.

Discussion

Both intra-list similarity of stimulus members of paired-associates and their Glaze association values - the task variables - had significant main effects on number of correct responses over 20 learning trials. In accordance with Underwood's (38) results for Ss run individually and findings of Saltz and Myers (26) for a group-administered task, low similarity lists, regardless of association value, were learned more rapidly than high similarity lists. The low similarity-low association value list was acquired somewhat more slowly than the high similarity-high association value list. However, ignoring similarity, high association value produced more correct responses than low association value. Saltz and Myers (26) have reported similar results for paired-associate learning but it is not clear whether they varied association values of stimulus members or of both stimulus and response members. Other findings of facilitative effects of increased association value and meaningfulness described by Noble (22) were for serial learning tasks.

The consequences of simultaneous variation of both variables in a factorial design had not been investigated previously. Because neither first-order interactions nor, with one exception, higher order interactions of these variables were significant, they apparently combined in an additive fashion. The curves for the significant higher-

order interaction of anxiety x stress x similarity x association value did not conflict with this conclusion. Because the over-all effect of similarity was slightly greater than that of association value the rank order of the lists from least to most difficult was low similarity-high association value, low similarity-low association value, high similarity-high association value, and high similarity-low association value.

The hypothesis that increasing anxiety and/or stress might produce divergent correct response curves for lists of increasing difficulty, also generated possibilities of no significant main effects for stress and anxiety. Although neither main effect was significant only that for stress may have reflected the counterbalancing interaction with task variables. Anxiety apparently functioned as a random variable.

More specifically, various interactions of stress, similarity and blocks presented a fairly consistent pattern of decreasing performance on the last two five-trial blocks resulting from stress and of a reversal for low and high similarity lists. For low similarity lists stress may have produced better performance than nonstress while the converse held for high similarity lists. The obtained reversal in the effects of stress for variations in task difficulty agrees with Castaneda and Palermo's results (3) for a paired-associate motor task. However, neither Lucas (18)

nor Lazarus and collaborators (16) obtained this effect with serial learning tasks.

The interaction of stress and similarity is more readily interpreted as reflecting increased drive rather than increased response competition consequences of stress. If the latter, stress should have had a detrimental effect on low similarity lists as well, although perhaps not quite so marked as for high similarity lists. Because this was not the case, the results are more consistent with the drive hypothesis which predicts greater advantage to correct response in low similarity lists and to incorrect responses in high similarity lists. There remains, of course, the presently untestable possibility that stress increases both drive and response competition, the former somewhat more than the latter.

In general, stress did not interact with association value. And, as noted above, no meaningful analysis of role of stress and/or anxiety in the one significant interaction, stress x anxiety x similarity x association value, seemed possible. Part of this interpretative difficulty may stem from present ignorance of the relationship between acquisition performance and association value. If it is assumed that response-produced cues resulting from increased association value enhance distinctiveness of stimulus members (10), increments in drive might further strengthen those mediating responses to produce even greater distinctiveness. Both low,

and high similarity lists to an even greater degree should then have gained under stress. The insignificant main effect of stress as well as the failure to obtain a stress x association value interaction are contrary to this explanation. Therefore, while more complicated and perhaps ultimately valid analyses in terms of counterbalanced facilitative and inhibitory processes might be advanced, at present, lack of adequate evidence renders such efforts unduly speculative.

Anxiety apparently did not combine with stress to result in three or four levels of drive and/or response competition nor did it interact separately with similarity and/or association value. Accordingly there were no empirical grounds for further consideration of the findings in terms of the three pre-experimental hypotheses derived from the simplifying assumptions of increased drive based on combinations of anxiety and stress interacting with three or four levels of response competition.

Although some investigators have reported main (20) or interactive (23) effects of anxiety, others have obtained mixed or negative results (16,24). Therefore it seems reasonable to conclude that the effects of anxiety are measurable with only certain types of tasks and/or under certain conditions for those tasks. For example, the conditions of the present task may have been such that high anxiety increased drive to produce better discrimination

among stimulus members while simultaneously producing more detrimental competing responses. However, separation of these effects, if possible, would require one or more specifically designed experiments.

Another explanation assumes that the group procedure employed was such that all Ss, regardless of differences in manifest anxiety scores, were functioning at the same situation-induced anxiety levels. Presumably high anxious groups were already close to their ceiling and low anxiety Ss were the only ones markedly affected by the group procedure. Subsequent stress would then have been added to equal levels of anxiety. One reason for an increase in anxiety might be that the situation resembled a classroom test. Or, the comments of some Ss that E's four-sec. pacing of the paired-associates made them "nervous," may have been symptomatic of a fairly general and uniform anxiety reaction to the conditions of administration. Again, however, the data provide no satisfactory evidence for this alternative interpretation.

The non-significant effects of anxiety on reactions to questionnaire items may have reflected the equalization of anxiety levels under group conditions postulated above. Although stress did result in somewhat greater doubt about the test's predictive value, since this was only one of five F's for effects of stress, little weight can be given to a conclusion that it had differential consequences. For this study, at least, the more conservative interpretation would

be that questionnaire responses were not influenced by stress.

In conclusion, the data support the experimental hypotheses only in limited fashion. Specifically, the postulated interaction of task and motivational variables was apparently limited to similarity and stress. Stress had facilitative effects for stimulus members of low similarity and detrimental effects for high similarity lists.

Summary

The present study investigated the main and interactive effects of two task variables, similarity and association values of stimulus members of paired associates, and two presumed motivational variables, manifest anxiety and stress. Two levels of these variables were used in a $2 \times 2 \times 2 \times 2$ factorial design with 10 undergraduate Ss in each cell.

Nine and 21 of common letters specified high and low similarity among eight stimulus members of high and eight stimulus members of low Glaze association values. High and low anxiety Ss were drawn from first and fifth quintiles of Taylor A-scale scores. Nonstress and stress induced by the false-norm method completed the sets of conditions. All anxious and nonanxious Ss were given 20 learning trials, with one of four lists representing combinations of high and low similarity and association value. The group method described by Saltz and Myers (26) was followed. Stress was introduced after the sixth and tenth trials with nonstress Ss receiving neutral distractive instructions after those same trials.

The significant main effects of increased similarity and association value were in expected directions of decreasing and increasing numbers of correct responses, respectively. Although main effects of stress and anxiety were not significant, stress apparently facilitated performance with low similarity lists and retarded it with high

similarity lists. Stress did not interact with association value nor did it combine with anxiety. Anxiety had no significant and/or interpretable interactive effects. It was concluded, therefore, that hypotheses of the interaction of task and motivational variables were supported only by interaction involving stress and similarity.

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Appendix

Instructions

Introductory Paragraphs of Instructions for Paired-associate Learning

Nonstress

"This is an experiment in learning nonsense syllables and not a psychological test. We are interested in certain relationships of the learning process common to all people, and are not concerned with your personal reactions."

Stress

"The materials of this experiment are to be included in an intelligence test designed especially for college students for which we are now obtaining standardization data. As you already know, intelligence is essentially a measure of how fast and thoroughly you can learn materials which are new to you. To remove the factor of previous experience, we have prepared specially constructed pairs of nonsense syllables which none of you have seen before. Your intelligence level will be estimated by how rapidly and well you learn these materials.

"From previous experience with similar materials, it is known that your scores will enable us to predict degree of academic success both in undergraduate and post-graduate work. Therefore, try very hard to learn as rapidly and well as you possibly can."

Paired-associate Learning

"The card before you has a learning and test side. There are four different booklets on the learning side and one test booklet on the test side. You will write your answers in the test booklet and make no other marks on the learning booklets.

"On every page of each of the learning booklets there are 2 syllables, which together make a pair. You will be told to work with an appropriate learning booklet and will have 4 sec. to study and learn each pair, at the end of which time, a signal will be given and you will be told to turn to the next pair where you will also have 4 sec. to study this, as well as subsequent pairs. After you have

studied the last pair of syllables in the appropriate booklet, you will turn the card over and at a signal told to open the test booklet where you will find only one syllable of each of the pairs. Next to each of these syllables on the one page write the syllable that appeared with it in the learning booklet.

"For example: On the first page of a learning booklet you might find ZIT PIR. Your task will be to learn these syllables as a pair, so that when ZIT appears alone in the test booklet, you will be able to write PIR next to it. On the second page of the same learning booklet you might find BOQ XYZ and you will be expected to write XYZ next to BOQ when it appeared in the test booklet underneath ZIT etc.

"If you do not know the answer you may guess since this will not hurt your score. Because we are interested only in your first response though, any erasures or crossing out of an answer will be scored wrong for that answer.

"The 2 syllables which make up each pair will always appear together; however, the pairs appear in the learning booklets in different orders. Your task will be to learn the pair so well that when you see only one syllable of the pair, you will be able to write the second syllable. Do not try to make up any special systems to learn the pairs since this will not help you. Simply learn to write the second syllables associated with the first syllables in the test booklet.

"Answer sheets will be collected after each trial. You will rip the pertinent answer sheet out of the test booklet, put your name on it and pass it to your left where the examiner will collect it.

"REMEMBER, follow the instructions of the examiner and turn the page exactly when told. You will have sufficient time to learn each of the pairs.

"Are there any questions?"

Statements to Produce Stress or Distraction

Stress

After 6th Trial: "As you have probably noticed, we have been scoring your test forms. Aren't you people trying? Maybe you're just not cooperating. In comparison to similar groups who have taken this test previously, you people are doing significantly poorer. Now, let's try to put in a little more effort."

After 10th Trial: "Maybe you people aren't taking this test seriously enough. In any event, we have not found any improvement. This is the last time you will be told of this."

Distraction

After 6th Trial: "There are a few things that we've noticed that we would like to mention. Please remember not to erase. Since other people will be using these same booklets, try not to abuse them. As you are aware this is an experiment in learning and it is important that control conditions are adhered to, so please turn the page when the examiner tells you."

After 10th Trial: "I'd just like to mention again, that while we are aware how tempting it is to try to go ahead of the examiner it is important that you all turn the page at the same time. Thank you."

Correct Responses for Successive Five-Trial Blocks

List I: High Association Value, Low Intra-List Similarity

<u>High Anxiety-Stress</u>					<u>High Anxiety-Non-Stress</u>				
<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>	<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>
L.M.	11	28	32	39	R.A.	14	30	39	38
N.G.	25	39	38	40	W.M.	15	28	34	39
L.H.	17	32	38	39	P.C.	11	17	35	37
R.C.	11	26	34	37	W.B.	26	34	38	40
C.C.	14	31	36	40	A.C.	4	14	27	33
O.B.	15	27	32	37	P.S.	14	34	39	36
R.C.	4	22	36	39	L.S.	6	20	27	34
B.M.	20	40	38	40	J.A.	1	14	34	40
M.P.	17	36	40	40	E.L.	8	30	28	37
M.C.	14	26	36	40	J.H.	2	16	26	31

<u>Low Anxiety-Stress</u>					<u>Low Anxiety-Non-Stress</u>				
P.S.	26	37	37	37	R.H.	24	37	37	39
P.D.	7	21	33	37	F.H.	31	40	40	40
P.L.	11	30	33	40	J.E.	18	31	40	40
R.O.	11	24	30	32	D.O.	13	36	39	39
P.Z.	9	16	21	28	J.K.	9	26	36	37
J.C.	21	36	39	40	R.S.	17	35	38	40
J.S.	17	37	40	40	R.M.	12	30	37	40
B.E.	20	35	40	40	G.B.	26	40	40	39
P.C.	14	28	37	40	A.C.	23	35	40	40
R.C.	7	27	40	39	J.D.	5	12	16	25

List II: High Association Value, Low Intra-List Similarity

<u>High Anxiety-Stress</u>					<u>High Anxiety-Non-Stress</u>				
<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>	<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>
G.D.	4	14	25	29	G.A.	11	38	39	38
F.W.	6	11	12	17	R.C.	15	28	33	40
L.W.	3	3	1	5	R.S.	7	22	33	34
L.F.	16	29	39	40	M.C.	9	15	29	35
R.W.	15	24	29	35	G.E.	8	22	30	32
R.P.	6	14	16	21	N.D.	14	29	37	40
H.U.	11	30	39	36	N.T.	24	35	38	40
M.O.	12	22	31	39	S.H.	6	12	33	39
D.P.	28	40	38	40	L.A.	17	27	33	37
J.N.	28	40	40	40	L.E.	5	9	13	13

<u>Low Anxiety-Stress</u>					<u>Low Anxiety-Non-Stress</u>				
<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>	<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>
G.A.	12	31	40	40	D.K.	14	20	29	23
R.H.	6	11	20	23	G.B.	7	22	34	29
E.D.	6	7	15	23	J.T.	9	28	35	39
N.P.	2	3	5	6	C.T.	1	4	6	12
E.R.	16	26	31	40	N.L.	8	11	26	35
J.C.	3	11	18	29	H.B.	8	14	30	38
W.G.	18	39	39	37	R.L.	7	13	19	28
M.F.	17	39	38	40	M.B.	4	15	29	35
C.M.	14	32	38	39	G.L.	15	23	26	35
P.S.	11	24	32	34	R.H.	19	37	39	35

List III: Low Association Value, Low Intra-List Similarity

<u>High Anxiety-Stress</u>					<u>High Anxiety-Non-Stress</u>				
<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>	<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>
E.Y.	12	37	40	40	S.N.	8	26	35	39
R.W.	15	33	36	39	C.S.	11	31	34	35
H.H.	15	35	40	40	D.L.	10	22	37	40
R.O.	5	11	19	24	W.B.	3	8	11	20
R.W.	11	29	39	38	M.F.	11	28	38	39
A.L.	4	9	17	26	S.E.	10	23	24	22
T.P.	17	36	40	40	B.A.	7	16	25	31
W.N.	10	26	34	32	A.M.	1	14	16	21
J.W.	12	35	36	40	P.H.	15	27	35	39
F.J.	16	37	38	40	J.W.	8	21	31	39
<u>Low Anxiety-Stress</u>					<u>Low Anxiety-Non-Stress</u>				
G.E.	7	19	32	32	M.K.	9	16	23	27
R.T.	1	4	6	18	R.D.	7	20	23	22
R.W.	4	6	14	20	F.A.	7	26	27	38
J.C.	10	25	37	39	G.M.	19	40	40	40
J.S.	9	22	30	31	S.R.	8	25	39	37
I.F.	20	29	39	40	R.W.	7	29	35	37
J.T.	5	13	24	36	F.D.	12	30	37	40
M.C.	7	27	35	40	J.M.	13	31	35	38
A.T.	4	24	39	40	B.S.	4	19	30	37
A.A.	0	8	27	38	M.G.	10	13	20	26

List IV: Low Association Value, High Intra-List Similarity

<u>High Anxiety-Stress</u>					<u>High Anxiety-Non-Stress</u>				
<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>	<u>S</u>	<u>1-5</u>	<u>6-10</u>	<u>11-15</u>	<u>16-20</u>
F.B.	4	5	8	12	K.P.	18	38	40	40
G.C.	5	9	16	19	E.S.	7	21	36	32
D.M.	2	6	10	13	J.B.	9	22	33	38
R.M.	5	26	34	38	J.F.	4	16	25	36
W.R.	7	6	12	17	D.O.	10	20	22	24
J.D.	3	5	9	14	B.D.	15	26	36	36
A.M.	12	32	38	39	S.M.	6	7	21	33
J.P.	11	16	27	40	N.S.	9	9	16	21
E.D.	12	29	38	40	B.L.	11	20	39	40
N.F.	3	7	15	16	C.S.	3	12	23	16
<u>Low Anxiety-Stress</u>					<u>Low Anxiety-Non-Stress</u>				
C.W.	15	30	21	31	F.I.	6	9	22	27
P.A.	3	9	6	9	D.C.	9	18	21	27
L.R.	3	16	15	16	R.C.	9	20	22	30
J.B.	10	7	15	22	E.C.	7	5	8	11
O.Z.	4	4	9	14	R.W.	8	19	22	29
E.C.	3	10	14	12	E.H.	12	29	38	38
R.J.	6	13	21	27	S.E.	12	21	35	39
L.F.	7	25	25	26	J.H.	5	11	17	22
M.R.	7	15	19	31	E.T.	4	13	33	38
B.T.	13	23	30	33	H.E.	3	8	15	16

Questionnaire

Please complete the following questionnaire to the best of your ability. Do not confer with anyone. Your answers will be kept strictly confidential. The purpose of this questionnaire is to evaluate the worth of the experiment in which you have just participated.

1. Name _____
2. Age _____ 3. Sex _____ 4. Psychology 26 section _____
5. Psychology 26 instructor _____

UNDERLINE YOUR ANSWER TO THE FOLLOWING QUESTIONS

6. How much did you like taking the test?
 a) liked very much b) liked c) average d) disliked
 e) disliked very much.
7. What did you think of the experimental conditions under which you took the test?
 a) very favorable b) favorable c) average
 d) unfavorable e) very unfavorable.
8. What did you think about the examiners?
 a) very competent b) competent c) average
 d) incompetent e) very incompetent
- *9. How do you feel about the test's ability to measure the learning process?
 a) very good measure b) good measure c) average
 d) poor measure e) very poor measure
10. How do you think you made out on the test?
 a) very well b) well c) average d) poor
 e) very poor

In the following space write any additional comments that you may have:

*The above questionnaire was presented in its entirety to the Nonstress group. The same questionnaire was presented to the Stress group with the exception that question number #9 read as follows:

"How do you feel about the test's ability to predict academic success?"

- a) very good measure.....

Responses to Questionnaire Items 6, 7, 8, 9, 10

Stress

	<u>High Anxiety</u>				
<u>S</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
R.W.	0	3	2	1	0
L.W.	1	1	1	4	2
E.D.	0	1	1	1	2
R.P.	1	2	2	2	3
D.M.	3	2	2	3	3
M.O.	2	3	3	3	3
F.B.	2	1	1	4	3
G.D.	1	2	1	2	2
T.P.	1	0	0	1	2
L.M.	2	1	1	2	1
H.H.	2	3	1	2	2
L.H.	1	2	1	2	1
J.P.	0	2	1	3	1
H.U.	1	2	1	1	2
A.M.	2	1	1	2	2
J.N.	2	1	1	2	1
E.Y.	2	2	(2)*	2	1
F.C.	1	1	1	3	2
F.J.	4	2	(2)	4	2
N.G.	0	1	1	1	0
G.C.	4	3	1	3	3
F.W.	4	2	0	1	4
R.O.	1	1	1	4	2
N.N.	2	3	1	2	2
C.C.	1	1	2	1	0
D.P.	2	1	2	2	2
R.W.	3	1	1	3	2
J.D.	2	4	2	2	4
J.W.	3	3	2	2	2
B.M.	2	1	1	3	1
R.W.	1	1	1	2	1
R.M.	0	1	1	(2)	2
C.F.	1	2	1	3	1
M.P.	2	2	1	1	0
A.L.	3	3	2	1	3
W.R.	4	2	1	4	4
R.C.	1	2	1	3	2
N.F.	2	0	1	(2)	3
M.C.	0	1	0	(2)	2
O.B.	0	1	1	1	1

	<u>Low Anxiety</u>				
<u>S</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
R.C.	1	3	1	1	1
R.W.	1	1	1	2	2
N.F.	3	2	1	(2)	0
E.R.	2	2	1	2	0
A.A.	0	2	2	2	2
L.W.	2	0	1	1	2
J.T.	1	2	1	4	1
P.S.	2	4	2	4	1
G.A.	3	1	0	3	2
M.R.	1	2	0	3	2
E.D.	4	1	1	2	3
R.T.	4	2	1	3	4
A.T.	2	2	0	2	2
P.C.	2	2	1	2	1
B.E.	0	2	1	2	1
L.R.	2	2	0	2	2
C.M.	0	1	1	1	1
P.A.	2	3	1	3	3
M.F.	1	1	1	(2)	1
J.D.	2	2	1	1	1
M.C.	4	3	2	4	1
C.W.	3	2	1	(2)	2
R.H.	1	1	1	1	3
G.E.	2	3	0	3	1
P.L.	2	2	2	3	1
R.O.	1	1	1	1	2
W.G.	2	1	2	3	1
P.S.	2	1	1	3	3
J.B.	2	2	1	1	3
J.C.	0	0	1	2	2
T.C.	2	2	1	1	3
B.T.	2	1	1	1	3
P.Z.	3	2	1	2	3
J.S.	2	2	1	1	2
T.C.	1	2	1	1	0
R.J.	3	3	1	3	3
J.S.	1	1	0	1	1
E.C.	4	2	1	2	4
I.F.	2	0	1	3	0
J.Z.	2	3	0	3	4

*The values that appear in parentheses represent answers to questions which were originally omitted by Ss but have been substituted on the basis of the average of all scores for the particular questions.

Non-StressHigh Anxiety

<u>S</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
A.M.	2	2	0	3	4
E.L.	1	3	0	1	2
M.C.	2	2	1	2	3
W.B.	2	3	1	2	2
E.L.	2	1	0	1	2
P.C.	1	3	1	1	2
B.A.	3	1	0	2	2
C.S.	2	1	1	1	3
R.S.	1	1	0	0	2
R.C.	1	4	2	1	1
W.B.	3	2	0	1	0
L.E.	3	2	0	3	4
J.H.	2	2	1	1	2
J.F.	(2)	1	1	1	2
A.C.	2	2	1	1	1
M.F.	1	1	1	0	2
J.A.	2	1	0	0	1
L.A.	2	1	1	3	2
D.O.	1	2	1	3	2
D.L.	2	2	1	1	2
L.S.	2	1	2	2	2
J.W.	0	2	1	2	2
N.S.	2	3	1	2	4
J.F.	2	3	1	1	2
S.H.	3	3	3	1	1
G.A.	2	1	0	3	1
J.B.	1	3	1	1	2
C.S.	2	2	1	3	2
S.M.	2	3	2	3	3
N.T.	1	2	1	1	1
E.S.	3	1	1	0	4
P.S.	1	3	2	1	1
W.M.	2	2	2	3	2
P.H.	3	2	2	0	1
N.D.	2	1	1	1	2
B.D.	2	3	1	2	1
G.E.	2	1	1	0	3
V.P.	1	3	1	0	0
R.A.	1	1	1	1	1
S.N.	1	2	1	1	2

Low Anxiety

<u>S</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
R.S.	1	1	0	3	1
S.E.	1	1	0	2	1
H.B.	1	1	1	1	2
R.W.	2	3	1	3	3
M.G.	3	3	0	1	4
E.H.	2	2	1	1	0
C.T.	1	(2)	1	(2)	2
R.W.	2	3	2	(2)	2
J.K.	3	2	2	(2)	2
N.L.	2	0	0	1	1
J.T.	1	3	1	3	1
R.L.	3	2	1	3	2
F.D.	0	1	0	0	1
R.M.	1	0	0	0	2
R.H.	3	3	0	1	2
D.O.	2	2	2	3	1
G.B.	2	2	1	1	3
E.C.	3	1	1	3	2
J.E.	2	2	2	3	1
H.E.	2	3	1	2	2
B.S.	1	2	2	1	1
S.R.	2	0	2	0	2
R.C.	2	2	1	2	2
F.H.	1	2	1	2	0
J.D.	2	2	1	3	4
G.M.	2	1	2	1	1
E.T.	2	1	1	2	2
D.C.	2	3	1	3	2
R.H.	1	1	1	2	1
F.A.	3	3	2	(2)	2
A.C.	2	1	1	3	1
R.D.	2	2	1	2	2
D.K.	2	1	1	0	1
J.H.	2	1	1	1	2
G.L.	2	2	1	3	3
G.B.	2	1	1	2	2
J.M.	2	2	1	1	2
M.K.	2	3	2	2	3
M.B.	1	2	1	2	3
F.I.	2	3	2	3	3

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Approved by:

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